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Life Events, Social Support, and Blood Pressure Control in Low -Income Hypertensive Patients.

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**LIFE EVENTS, SOCIAL SUPPORT, AND BLOOD PRESSURE
CONTROL IN LOW-INCOME HYPERTENSIVE PATIENTS**

A Dissertation

**Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy**

in

The Department of Psychology

by

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ABSTRACT

This study examined whether minor, chronic, and major stressors predicted poor blood pressure control in low-income hypertensives, and whether social support served as a moderator of this relation. Additionally, whether the construct of social support served as an independent predictor of poor blood pressure control was also examined. Participants included 231 patients randomly recruited from primary care medicine clinics at a public medical center. The sample included in this study was selected from an existing data set. The existing data set consisted of 432 patients randomly chosen on consecutive days from a family practice and an internal medicine medical clinic at a public teaching hospital. All participants were determined to have hypertension and categorized as having either controlled or uncontrolled hypertension by a primary care physician.

Participants were administered a demographic form, the Weekly Stress Inventory (WSI), the Interpersonal Support Evaluation List (ISEL), questioned about their cigarette smoking and alcohol consumption, and their Body Mass Inventory (BMI) was assessed. Following recruitment, the WSI was administered bimonthly over the telephone for 10 months and in-person at a twelve-month follow-up interview. Participants were also administered the ISEL, and their BMI was reassessed at the twelve-month interview. Finally, participants were administered the Life Events Schedule (LES) at the six-month telephone interview and at the twelve-month follow-up interview.

The sample consisted of predominantly African-American (82%), unemployed (62%), females (77%), with a mean age of 51 (\pm 11) years. Mean income of the sample was \$509.74 (\pm \$453.62). A total of 61 (26%) individuals had controlled blood pressure and 170 (74%) were uncontrolled. Stress was not found to predict blood pressure control in this sample of low-income individuals attending primary care clinics. Social support was also not found to predict blood pressure control, or moderate the association between stress and uncontrolled hypertension. However, a logistic regression revealed that prescription of a calcium channel antihypertensive medication and number of missed appointments were significant predictors of blood pressure control. Factors which may have contributed to the negative findings were identified, and suggestions are made for future research.

INTRODUCTION

Estimates indicate that as many as 50 million Americans have elevated blood pressure or are being prescribed antihypertensive medication, and hypertension is considered the most prevalent cardiovascular disease (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure - JNC VI, 1997; Subcommittee on Definition and Prevalence of the 1984 Joint National Committee, 1985). The prevalence of hypertension increases with age, ranging from a low of 2% for Caucasian females between the ages of 18-24 to 83% for African-American females between the ages of 65-74 [U.S. Department of Health and Human Services (Public Health Service), 1992].

Hypertension is one of the major risk factors for the development of coronary artery disease, coronary heart disease, and the single most important risk factor for cerebrovascular diseases (JNC V, 1993). Heart and vascular diseases have been the major cause of death for over 40 years in the United States and are currently responsible for half of all deaths (Blanchard, Martin, & Dubbert, 1988). At every level of increased diastolic or systolic blood pressure, incidence of nonfatal and fatal cardiovascular diseases including coronary artery disease, coronary heart disease, cerebrovascular diseases, and renal disease increases (JNC V, 1993). Finally, it has been estimated that total health care cost for hypertension reach \$15 billion annually (Barrie, 1996).

The southeastern region of the United States has been identified as a region of especially poor health outcomes associated with hypertension (JNC VI, 1997; Shea, 1994). Louisiana in particular, ranks in the top nine of all southeastern states for

mortality from cerebrovascular disease, ischemic heart disease, diabetes mellitus, and end-stage renal disease (Lackland & Moore, 1997). Second, it is interesting to note that control rates for hypertension have been reported to be lower among minority and socioeconomically disadvantaged groups (Kaplan, 1994; Moorman, Hames, & Tyroler, 1991). Finally, the percentage of hypertensives who are aware, being treated, and adequately controlled has shown steady improvement over the past 15 years (Burt et al., 1995; Whelton & Brancati, 1993). Surprisingly, even though the percentage of individuals in the United States who are aware that they have high blood pressure increased from 51% to 73% from 1976 to 1991, treatment and control rates are still poor (Burt et al., 1995). Specifically, during this time period, treatment has only increased from 31% to 55% within hypertensives, and the number of hypertensive individuals whose blood pressure is controlled below 140/90 mm Hg has only increased from 10% to 29%.

Although a definitive etiology of essential hypertension has not yet been discovered, a number of psychosocial factors have been implicated as playing a role in blood pressure control in hypertensives. Further study of these psychosocial variables may provide valuable information that may lead to more effective treatments for hypertension. In contrast to prior research which has focused primarily on the role of major life events (i.e., major stress) and social support in blood pressure control, this study aims to examine whether social support serves as a moderator between stress and blood pressure control. Further, unlike previous studies, the current study also aims to examine the impact that minor stress and chronic minor stress have on blood pressure

control. The current study seeks to investigate whether social support has a direct association with blood pressure control. Such information could prove useful to researchers and policy makers when designing intervention programs targeting hypertension. Second, the results of this study may yield results that may further models attempting to account for poor blood pressure control in established hypertensives. Finally, this study seeks to provide evidence about whether social support operates as a buffer in the association between stress and blood pressure, or whether it appears to have a direct relation with blood pressure.

Hypertension

Definition

Hypertension refers to a medical condition in which an individual has a blood pressure “higher than that judged to be normal” (Thomas, 1989). Although the specific etiology for this condition can only be determined in a small number of patients, the primary factor in hypertension itself is an increase in peripheral resistance resulting from vasoconstriction or narrowing of peripheral blood vessels (Thomas, 1989). According to the JNC VI (1997), for adults aged 18 years and older, systolic blood pressure (SBP) values <130 mmHg and diastolic blood pressure (DBP) values <85 mmHg are considered normal. SBP values from 130-139 mmHg and DBP values from 85-89 mmHg are considered high normal. SBP values ≥ 140 mmHg and DBP values ≥ 90 mmHg are considered hypertensive.

According to the JNC VI (1997), among hypertensives, individuals with SBP values from 140-159 mmHg and DBP values from 90-99 mmHg are classified as Stage 1

hypertensives while those with SBP values from 160-179 mmHg and DBP values from 100-109 mmHg are considered Stage 2 hypertensives. Individuals with SBP values ≥ 180 mmHg and DBP values ≥ 110 mmHg are considered Stage 3 hypertensives. Hypertension should not be diagnosed on the basis of a single measurement (Thomas, 1989). If initial elevated readings are found, they should be confirmed on at least two subsequent visits (JNC VI, 1997; Thomas, 1989).

Etiology

While the etiology of essential hypertension is currently unknown, medical and psychological risk factors for its' development have been proposed. Medical risk factors include family history of hypertension, excessive caloric intake, inactivity, excessive alcohol consumption, and low intake of potassium (JNC VI, 1997). Research on the impact of these risk factors in the development of hypertension is inconclusive at present.

Researchers have also hypothesized that psychological factors may play an important role in the etiology of hypertension. Three general approaches have historically been used to examine the role of psychological factors in the development of hypertension (Pickering, 1995). These approaches are 1) examination of the effect of environmental stressors, 2) the search for personality differences between normotensives and hypertensives, and 3) the study of individual differences in blood pressure reactivity to psychological stressors. Presently, research remains inconclusive regarding the role of any of these psychological variables in the development of hypertension.

The study of environmental stressors in the development of hypertension has focused on the role of discord between individuals and their social environment. The

“job strain” model (Karasek et al., 1981), the “defense-defeat model” (Henry & Stephens, 1977), and the concept of “John Henryism” (James, Hartnett & Kalsbeck, 1983) have all originated from this approach. The search for personality differences between normotensives and hypertensives has focused largely on the notion that hypertensives repress hostility (Alexander, 1939) and the existence of the “Type A personality” (Friedman & Rosenman, 1974).

Among the three general approaches that have been used to examine the role of psychological factors in the development of hypertension, the study of individual differences in blood pressure reactivity has received the most attention (Pickering, 1995). Originating from this approach, the proposal of the “reactivity hypothesis” in particular has led researchers to examine whether certain individuals have an exaggerated blood pressure response in reaction to psychological stress. Central to this hypothesis, Folkow (1987) proposed that stressors initially produce transient elevations in blood pressure by neurohormonal mechanisms (e.g., sympathetic nervous system activation), and that, over time these elevations induce permanent structural changes in the arterial wall, which ultimately result in a sustained increase in vascular resistance. This vascular resistance then acts to maintain the pressure at a higher level even in the absence of the pressor stimuli. It should be noted that, at present, evidence directly supporting this mechanism is lacking (Pickering, 1995).

Stress

The term “stress” is rather ambiguous, and it has been used in a variety of ways in the literature. Lazarus and Folkman (1984) state that “psychological stress is a

particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (p. 19).

There is considerable evidence which suggests that a relation exists between stress and illness. Despite this, one conclusive model does not currently exist that accounts for this association. Brantley and Garrett (1993) reviewed five models of how stress might lead to disease or illness. They found that some researchers have proposed that exposure to stressors might induce an alteration in physiological functioning, increasing the likelihood of disease or illness. Other researchers have suggested that stress may lead to a reduction in an organism’s resistance to disease. A third hypothesis is that stress may trigger a neurological hypersensitivity to excitation, leading to illness or arousal disorders. Finally, some researchers have postulated that stress affects health indirectly through increased high risk behaviors or a general inability to cope with stressful situations.

The most widely used methods of assessing stress have included self-report questionnaires and laboratory stress tests (Brantley & Jones, 1993). Laboratory stress tests introduce a standardized stressor (e.g., cold pressor, mental arithmetic) in a controlled environment. On the other hand, self-report measures of stress ask respondents to indicate their current level of stress or the level of stress which they have experienced over a given interval of time using a measurement scale. Validity of subjective ratings of stress have been demonstrated by their relation with standardized stress questionnaires, and with neuroendocrine and physiological measures of stress.

Significant increases in self-report stress ratings have been found to correspond with significant increases in blood plasma levels of epinephrine and cortisol (McCann et al., 1993), as well as with significant increases in skin conductance (Goetsch, VanDorsten, Pbert, Ullrich, & Yeater, 1993), upon presentation of a psychological stressor.

Traditionally, the most common self-report method of assessing stress has been the measurement of major life events (Brantley & Jones, 1993). Major life events have been defined as "...a class of stressful stimuli or situations to which everyone is exposed to a greater or lessor extent in the natural course of life" (Dohrenwend & Dohrenwend, 1974, p.1). Examples of major life events include experiences such as marriage, death of a close spouse, change of residence, or outstanding personal achievement.

More recently, the assessment of stress has also included the measurement of minor stressors, commonly labeled as "hassles". Minor stressors have been defined as "...experiences and conditions of daily living that have been appraised as salient and harmful or threatening to the endorser's well being" (Lazarus, 1984, p. 376). Examples of minor stressors include having car trouble, running out of pocket money, or having unexpected guests. Surprisingly, recent research comparing major and minor stressors has shown that minor stressors may have a greater impact on an individual's general well-being than major stressors (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Garrett, Brantley, Jones, & McKnight, 1991; Holahan & Holahan, 1987; Monroe, 1983; Weinberger, Hiner, & Tierney, 1987). Further, Kanner, Coyne, Schaefer, and Lazarus (1981) have suggested that minor life stressors may serve as an indicator of how one is

affected by life changes, and may serve as a better predictor of an individual's health status than major life stressors.

Recently, investigators have begun to examine the influence of chronic stressors on health (Lepore, 1995). "Chronic stressors are usually conceived of as discrete events and conditions, or constellations of related events and conditions, that persist over time" (Lepore, 1995, p. 103). Examples of chronic stressors include overcrowding, environmental pollution (e.g., noise pollution, air pollution), unemployment, or inability to afford the basic necessities of living, such as food or clothing. In a recent study Cohen et al. (1998) discovered that chronic stressors, lasting one month or longer, were associated with greater susceptibility to common cold viruses, while stressors lasting less than one month were not found to alter susceptibility to colds. Interestingly, this study also found evidence suggesting that the longer the duration of the stressor, the greater the increased risk for colds.

Lepore has suggested that investigating chronic stress may be of importance for several reasons. He has asserted that it is theoretically more plausible to link diseases that have a long-term development to persistent stressors, than to those that are acute and time-limited. Second, Lepore has noted that emerging evidence has suggested that humans do not always habituate to chronic stressors and that these stressors can enhance the negative impact of acute stressors (see Brown & Harris, 1978; Herbert & Cohen, 1993; McGonagle & Kessler, 1990). Third, there is a limited amount of evidence that individuals may perceive chronic stressors as more intense than minor stressors (Scarinci, Ames, & Brantley, in press).

Despite the fact that evidence is accumulating that suggests chronic stressors play a role in the development of disease, the issue of operationally defining this construct has been neglected. In an effort to reach a conservative definition of chronic stress, Scarinci et al. (in press) operationally defined chronic stressors as events (i.e., minor stressors) that respondents reported as occurring an average of greater than 65% of the time.

The Impact of Stress on Blood Pressure Control

As noted above, the reactivity hypothesis has driven researchers to examine whether certain individuals display exaggerated blood pressure reactivity to psychological stress. A large volume of experimental evidence has demonstrated that blood pressure increases upon exposure to common laboratory stressors (e.g., mental arithmetic, cold pressor, video game) and that this blood pressure response is especially pronounced among groups at high risk for hypertension (e.g., individuals with parental history of hypertension), in borderline hypertensives, and in hypertensives (Ames, 1997; Carroll, Harris, & Cross, 1991; Drummond, 1985; Everson, Lovallo, Sausen, & Wilson, 1992; Jorgenson & Houston, 1981; Manuck, Giordani, McQuaid, & Garrity, 1981; Manuck, Kasproicz, & Muldoon, 1990; Manuck, Proietti, Rader, & Polefrone, 1985; Sims & Carroll, 1990; Steptoe, Melville, & Ross, 1984; Waked & Jutai, 1990).

Related to the research revealing differences in blood pressure response to laboratory stressors between normotensives and hypertensives, there is some evidence suggesting that trait anxiety may be associated with the development of hypertension. A study conducted by Somova, Connolly, and Diara (1995) using a student population at the University of Zimbabwe, Harare found a measure of anxiety focusing on frequency of

feelings of anxiety, including somatic symptoms related to anxiety, to be an independent predictor of development of hypertension in Black African students. Additionally, anxiety remained an independent predictor even after controlling for biological variables including initial blood pressure, heart rate, body mass, family history of hypertension, family history of diabetes, alcohol intake, smoking, and number of years of urbanization. A similar study conducted by Markovitz, Matthews, Kannel, Cobb, and D'Agostino (1993) followed a cohort of initially normotensive subjects eighteen to twenty years and found anxiety to be a significant independent predictor of the development of hypertension in middle-aged men.

Although it is clear that laboratory stressors are capable of producing acute increases in blood pressure and may have a role in the etiology of hypertension, little is known about the impact of stress on blood pressure control within already established hypertensives. A recent study conducted by Joshi, Salker, and Heller (1996) discovered that major life events were a significant independent predictor of uncontrolled hypertension within a sample of hypertensives living in central India. Interestingly, controlled and uncontrolled hypertensives did not found differ significantly in the mean age, mean body mass index, gender distribution, alcohol intake, cigarette smoking rate, educational level, occupational status, or marital status.

A study conducted by Caldwell et al. (1983) completed in the United States found similar results. Specifically, these authors found poor blood pressure control was significantly associated with a higher major life events score in subjects being treated for moderate and severe essential hypertension. Buck and Donner (1984) also discovered

that unexpected or unpleasant major life events were significantly associated with a loss of blood pressure control within subjects whose blood pressure was previously controlled.

Similarly, Egan, Kogan, Garber, and Jarrett (1983) found that hypertensive males with uncontrolled blood pressure, entering into a hypertension self-management program, reported significantly greater levels of major life events that occurred in the six to twelve months prior to the time they presented for treatment, than did hypertensive males with controlled blood pressure. It should be noted that there were no significant differences between the two groups in terms of compliance or in terms of the number of sessions that were attended. These findings were remarkable because the study revealed that prospectively determined baseline characteristics were able to distinguish between those subjects, who after a hypertension self-management program, exhibited controlled versus uncontrolled blood pressure. These results lend support to the notion that major life events may contribute to the maintenance of high blood pressure even after actively engaging in efforts to decrease it. Thus, the authors concluded that stress may have caused increased physiological arousal in an already cardiovascular reactive individual.

As is apparent from the literature reviewed above, researchers have focused primarily on the association between major life events and blood pressure control. As a result, information is not currently available about the influence that minor and chronic stressors may have on blood pressure control in established hypertensives.

Social Support

Conceptualization

It is very difficult to arrive at one precise definition of social support, since researchers have conceptualized and measured it in a wide variety of ways (Callaghan & Morrissey, 1993; Cohen, 1988; Lazarus & Folkman, 1984; Pearson, 1986; Veiel & Baumann, 1992). An early attempt by Cobb (1976) to conceptualize the concept of social support consisted of three crucial components including: (1) information that one is being cared for and loved (e.g., nurturance, affiliation); (2) information that one is esteemed and valued (e.g., recognition, respect), and; (3) information that one belongs to a group. In a more recent attempt to define social support, Shumaker and Brownell (1984) asserted that social support can be defined as an interaction of resources shared by at least two individuals that is perceived by either the provider and/or the recipient as an intention to enhance the well-being of the recipient.

Examination of prior attempts at defining social support highlight the fact that conceptualizations typically imply abstractions involving persons, behaviors, relationships, or social systems (Veiel & Baumann, 1992). This has led some researchers to propose that social support is really a “metaconcept” that lacks specificity and definition, rather than a singular definable entity (Barrera, 1986; Vaux, Phillips, Holly, Thomson, & Stewart, 1986). The diversity of conceptualizations that are subsumed within the concept of social support can be accounted for by the wide variety of types of social support (e.g., emotional vs. instrumental), sources of social support (e.g., spouses

vs. family vs. friends), or other facets, forms, or expressions of this concept that have been proposed (Veiel & Baumann, 1992).

Social support is often viewed as a feature of the social environment, and as such it is seen as a resource that must be cultivated and used (Lazarus & Folkman, 1984). Alternatively, social support may also be viewed as a type of coping competence or social skill that an individual learns and then is able to use during stressful encounters with the environment. Lazarus and Folkman propose that since little is currently known about the processes by which social support operates under stressful conditions, or about how social support may attenuate the subjective experience of stress, researchers are not currently in a position where they are able to choose between the numerous theoretical options available.

As a result of the variety of ways the concept of social support may be defined House and Kahn (1985) have suggested that an overarching structure might be imposed on the concept by examining the types of social support measures currently in use. These researchers suggest that the majority of social support measures presently in use assess the dimensions of social networks, social relationships, and/or social supports. Specifically, the dimension of social networks refer to measures developed from the perspective of formal network theory which include measures of network size, density, multiplexity, reciprocity, durability, intensity, frequency, homogeneity, and dispersion. Second, measures that evaluate social relationships tap the existence, quantity, and type of existing relationships. Third, measures that assess social support examine the resources that are provided by others including type (e.g., tangible, emotional,

informational; see Schaefer, Coyne, & Lazarus, 1982), source, quantity, and quality. In sum, a common notion of the concept of social support can be reached by incorporating the concepts that are most often measured into a definition.

In conclusion, the lack of a commonly accepted notion of what the concept of social support entails, makes it extremely difficult to integrate results obtained in different areas, or those that were discovered using divergent methodologies (Veiel & Bauman, 1992). Further, it is particularly important that some sense of agreement be reached, since many researchers are currently in the process of building models that attempt to account for the manner in which social support impacts health. Thus, in order to prevent the efforts of researchers from leading to fragmentation of the field, a widely shared conceptualization of what is meant by the term social support is needed.

For the purposes of the current study, a definition based upon work by Shumaker and Brownell (1984) was constructed. In the present study, social support will be defined as the perceived availability of resources received from other individuals. Additionally, the recipient must view these resources as intentions to enhance his or her well-being.

Measurement

As a result of the lack of a commonly accepted operational definition of the concept of social support, numerous attempts have been made to quantify social support, and a number of instruments are available. Social support measures can be divided into three general categories (1) social network measures, (2) measures of social support

reported to have been received, and (3) measures that assess the degree of social support the person perceives to be available (Monroe, 1989; Sarason & Sarason, 1994).

Social network measures examine the embeddedness of a individual within a social network (Monroe, 1989; Sarason & Sarason, 1994). Sarason and Sarason (1994) note that this approach has three unique advantages including, (1) that it provides an extension of the range of the social relationships examined, (2) it provides a manner for assessing the structure of relationships and allows comparison of different types of structures and, (3) it allows researchers to examine multiple aspects and effects, both positive and negative, of relationships recorded. On the other hand, social network measures have been criticized on the basis that they are only capable of measuring very general relationships and are not able to distinguish between relationships of primary and secondary importance (e.g., close family members versus acquaintances at work) (Monroe, 1989).

Other measures assess the degree of social support the individual reported was received or the level of support perceived to be available should the need arise (Monroe, 1989; Sarason & Sarason, 1994). However, the literature suggests that there is little in common between these two methods of assessment. Researchers have discovered that the perception of available support is a better predictor of well-being than report of social support that was actually obtained (Antonucci & Isreal, 1986). In addition, other researchers have found perceived social support to be a significant predictor of natural killer cell activity in breast cancer patients (Levy et al., 1990). Finally, Sarason and Sarason (1994) propose that measures of perceived social support are superior to those

that measure received support because measures of received support are confounded with stressful life events. Specifically, individuals who encounter a greater number of life events generally receive more support from others as a direct result of the situation.

Perceived social support can be conceptualized either in terms of aggregate or functional support (Sarason & Sarason, 1994). While the aggregate view emphasizes the person's appraisal of available social support and his or her satisfaction with the amount that is available, the functional view emphasizes the importance of matching the support available to the person's need. Cohen and Wills (1985) assert that functional measures of social support, have yielded more consistent evidence for the stress buffering effects of social support than have structural measures. The rationale for this conclusion arises out of the logic that if a particular stressful life event elicits the need for a support resource related specifically to that stressor, then the effects of the stressful event are buffered to the extent that social support resources are available to the individual (Brookings & Bolton, 1988). In sum, since the buffering effect is hypothesized to be cognitively mediated, a measure of the availability of social support during times of stress would be a more sensitive indicator of the presence of buffering effects (Cohen et al., 1985).

Social Support and Blood Pressure

There is a large amount of evidence that social support has a positive effect on physical health and may moderate the relation between stress and physical illness (Cohen & Hoberman, 1983; House, Landis, & Umberson, 1988; Levy et al., 1990; Orth-Gomer & Unden, 1990). Since not all individuals who experience high levels of stress develop

high blood pressure, researchers have become interested in the role that social support may play in this relationship. However, thus far, research has failed to provide a simple explanation of the processes through which social support acts as a moderator (Cohen & Wills, 1985). Currently, empirical evidence exists for two models, (1) the buffering model, and (2) the main effect model. The buffering model asserts that social support protects or “buffers” an individual from the harmful effects of stressors. On the other hand, the main effect model posits that social support has health preserving effects regardless of whether the individual is under stress or the level of stress being experienced. Currently, there is evidence that is consistent with both models (Cohen & Wills, 1985; Gerin, Milner, Chawla, & Pickering, 1995; Wilcox, 1981).

Cohen and Wills (1985) concluded that the literature favors the main effect model when the number of persons in one’s support network is measured (i.e., support structure), whereas buffering effects are typically discovered in research that measure the type of support the individual receives (i.e., support function). These researchers theorize that being part of a support structure provides an individual with generally constant benefits that are not related to the presence of a particular stressor. In addition, a particular stressor may elicit the need for a type of support related specifically to that stressor.

There is evidence that suggests that the presence of social support under stressful conditions may moderate the cardiovascular response to that situation (Gerin et al., 1995; Gerin, Pieper, Levy, & Pickering, 1992; Kamarck, Manuck, & Jennings, 1990; Lepore, Allen, & Evans, 1993). However, the literature is currently mixed about

whether social supports operates in a manner consistent with the buffering hypothesis or the main effects model in relation to blood pressure. Second, experimental evidence is also mixed regarding whether social support moderates systolic blood pressure, diastolic blood pressure, or both systolic and diastolic blood pressure reactivity to stress.

As reviewed above, exaggerated blood pressure response to stressors has been implicated by the reactivity hypothesis as a possible etiology for the development of hypertension. Although it is not currently clear how social support may operate to moderate an increase in blood pressure to stress, Cohen (1988) proposed that a social network or available social support may exert direct psychophysiologic influence, altering neuroendocrine or hemodynamic functioning in a manner that promotes cardiovascular health.

Specifically, since it is assumed that the nervous, endocrine, and cardiovascular systems operate in an integrated manner, social support might alter an individual's information processing system (i.e., nervous system), thereby influencing endocrine and cardiovascular function (Lazarus & Folkman, 1984; Turner, 1994). Extending the logic of this hypothesis, Karmack et. al (1990) speculates that, from the standpoint of the reactivity hypothesis, if individual differences in cardiovascular reactivity in reaction to stress are central to the etiology of hypertension, then any regular dampening of cardiovascular stress responses associated with social relationships would provide a mechanism by which social support might moderate cardiovascular disease.

Alternatively, Cohen (1988) proposed that social support might exert a moderating

effect on cardiovascular health through significant others who may promote healthful behaviors or encourage the individual to utilize an appropriate level of medical care.

The Present Study

Summary and Rationale

This study represents the first investigation of social support as a moderator of the association between major, minor, and chronic stress and blood pressure control in low-income adults attending primary care medical clinics. Control rates for hypertension have been found to be lower among socioeconomically disadvantaged groups (Kaplan, 1994; Moorman et al., 1991). The extent to which stressors have an impact on blood pressure control in this population is an issue that has been neglected. Additionally, this study represents the first investigation of minor and chronic stress as predictors of poor blood pressure control in established hypertensives. Further study of these psychosocial variables may provide valuable information that may lead to more effective treatments for hypertension.

Although it has been repeatedly demonstrated that laboratory stressors are capable of producing acute increases in blood pressure, very little is known about the impact of stress on blood pressure control within individuals with hypertension. Further, despite the fact that psychosocial factors have been implicated as playing a role in blood pressure control, prior research has focused primarily on the role of major life events in blood pressure control. However, despite this focus, currently there still exists only a very limited amount of evidence suggesting a relation between major life events and blood pressure control (Caldwell et al., 1983; Joshi et al., 1996). Thus, the current study

seeks to replicate past findings with major stress in a low-income population, and extend prior research, which has examined major life events as a predictor of blood pressure control, to minor and chronic stressors.

Some authors have asserted that minor stressors may have a greater impact on an individual's well-being than major stressors, and may be a better predictor of health status than major stressors (DeLongis et al., 1982; Garrett et al., 1991; Holahan & Holahan, 1987; Kanner et al., 1986; Monroe, 1983; Weinberger et al., 1987).

Additionally, a number of researchers have argued that chronic stressors may be resistant to habituation (Lepore, 1995), and that chronic stressors may serve to enhance the negative impact of acute stressors (Brown & Harris, 1978; Herbert & Cohen, 1993; McGonagle & Kessler, 1990).

A great deal of evidence exists suggesting that social support has a positive effect on physical health by moderating the relation between stress and physical illness (Cohen & Hoberman, 1983; House et al., 1988; Levy et al., 1990; Orth-Gomer & Unden, 1990). Although evidence suggests that social support may moderate blood pressure increase in response to laboratory stressors (Gerin et al., 1995; Gerin et al., 1992; Kamarck et al., 1990; Lepore et al., 1993), the moderating effect of social support on major, minor, and chronic stressors has not yet been examined, especially not in a low-income, hypertensive population. Further, the issue of whether social support is directly associated with blood pressure control has also been neglected in this population.

In sum, the current study sought to explore whether minor, chronic, and major stressors predicted poor blood pressure control in low-income, established hypertensives

and whether social support served as a moderator of this relation. In addition, the present study sought to assess whether the construct of social support served as an independent predictor of poor blood pressure control. As noted above, such information could prove useful to researchers and policy makers when designing intervention programs targeting hypertension. Second, the results of this study may contribute to models attempting to account for poor blood pressure control in established hypertensives. Third, this study may provide further evidence about whether the relation of social support and blood pressure control operates in a manner consistent with the buffering hypothesis or the main effects model.

Research Questions and Hypotheses

Based on the above summary and rationale, the present study addressed the following questions:

- 1) Do major, minor, and chronic stress collectively serve as an independent predictor of uncontrolled hypertension? It was hypothesized that these constructs collectively would serve as an independent positive predictor of uncontrolled hypertension.
- 2) Do major, minor, and chronic stress each independently serve as a predictor of uncontrolled hypertension? It was hypothesized that each of these three constructs would serve as an independent positive predictor of uncontrolled hypertension.
- 3) Does social support serve as an independent predictor of uncontrolled hypertension? It was hypothesized that this construct would serve as an independent negative predictor of uncontrolled hypertension.

4) Does social support moderate the association between stress (major, minor, and chronic stress considered individually or considered collectively) and uncontrolled hypertension? It was hypothesized that participants who had low social support would also be more likely to have uncontrolled hypertension.

METHODOLOGY

Participants

The sample consisted of 249 adult male and female hypertensive patients randomly recruited from the Family Practice and Internal Medicine Clinics of Earl K. Long Medical Center (EKL). The sample included in this study was selected from an existing data set. The existing data set consisted of 432 patients chosen on consecutive days from the clinics cited above. A table of random numbers was used to select participants from a list of patients with clinic appointments on a given day. EKL is a teaching hospital that provides care to a population that consists primarily of patients from a lower socio-economic status (95.3%) and of African-Americans (77.2%). Both the Family Practice Clinic and Internal Medicine Clinic are primary care clinics within this medical center that primarily serve low-income patients. The U.S. Bureau of the Census classifies adults at or below 200% of the poverty line as being within the low-income bracket. In 1996 the poverty threshold was an annual income of \$7,995 for one person in the household (U.S. Bureau of the Census, 1998). Therefore, individuals earning \$15,990 or less would qualify as low-income. The poverty threshold for families uses a formula based on the number of individuals comprising the family. For example, a family of three with an annual income less than or equal to \$12,516 would meet the poverty threshold. A family of three would be considered low income with an annual income less than or equal to \$25,032.

All participants were determined to have hypertension by a primary care physician. In addition, all participants were being treated for hypertension with medication prior to entering the study and also throughout the course of the study. A study examining a sample of EKL internal medicine patients discovered the incidence of hypertension to be 58% (Carroll, 1996). Another study examining 1083 low-income patients attending primary care clinics at six sites in Louisiana yielded a hypertension incidence rate of 51% (Scarinci, Boudreaux, Carmack, Ames, & Brantley, 1998).

Participants were categorized as having either controlled or uncontrolled hypertension by a primary care physician. Adequately controlled hypertension was defined as mean blood pressure readings less than 140 mmHg systolic and 90 mmHg diastolic gathered from clinic records. Studies report that only 12% (Stockwell et al., 1994) to 32% (Joshi et al., 1996) of all treated hypertensives have adequate blood pressure control.

Measures

1994 Behavioral Risk Factor Surveillance System (BRFSS) (Centers for Disease Control, 1994). The BRFSS is a questionnaire that has been widely used to identify high risk behaviors among noninstitutionalized adults (≥ 18 years of age) in the continental United States. The BRFSS evolved from telephone surveys developed by the Centers for Disease Control (CDC) and state health departments in the early 1980s with the purpose of developing a system for estimating the prevalence of high-risk behaviors in the population (Remington et al., 1988). The data gathered through the use of the BRFSS is a central component of both federal and state activities designed to monitor

progress toward achieving specific health objectives for the year 2000 (U.S. Department of Health and Human Services [Public Health Service], 1992). The 1994 BRFSS includes demographic, health status, health care access, diabetes, leisure-time physical activity, alcohol consumption, cigarette smoking, nutrition, weight control, women's health, and AIDS knowledge and testing questions. Reliability was found to be above .70 in tri-ethnic (i.e., Caucasian, African-American, and Hispanic) populations (Shea, Stein, Lantigua, & Basch, 1991; Stein, Lederman, & Shea, 1993). The present study only included questions drawn from the sections on cigarette smoking and alcohol consumption.

The alcohol consumption section measured the average total amount of alcoholic beverages each participant reported consuming during the past 1 month. Number of alcoholic beverages was measured in a standardized manner so that different types of beverages could be compared. The cigarette use section measured the average total number of cigarettes each participant reported smoking during the prior month.

Body Mass Index (BMI) - This is a measure of adiposity. BMI is the standard used to describe body composition. It has been compared to other height-weight ratios and has been found to be a valid measure of adiposity (Billewicz, Kelmsley, & Thomson, 1962). BMI was calculated as kg/m^2 . Height and weight was gathered via self-report.

Demographic Questionnaire - This is a 16-item questionnaire that was designed specifically for use in the current study (see Appendix A). It includes questions assessing age, gender, race, marital status, educational level, occupation, average monthly income,

previous mental health contact, history of treatment for drug/alcohol abuse, insurance coverage, address, and telephone number.

Interpersonal Support Evaluation List (ISEL) (Cohen, Mermelstein, Kamarck, & Hoberman, 1985) - The ISEL is a 40-item, self-report measure that assessed the participant's perception of availability of functional social support. Examples of items include, "I often meet or talk with family and friends", and "if I were sick, I could easily find someone to help me with my daily chores". The ISEL asked the respondent to rate how accurately the items described their access to social support on a four-point Likert scale. A total score and four sub-scale scores may be computed from the ISEL. However, only the total score was used in the present study. Cohen et al. (1985) reported good test-retest reliability for the total score, with reliability coefficients averaging .87. Cohen and Wills (1985) have reported adequate concurrent and discriminant reliabilities ($r = .46$ and $r = -.64$, respectively).

Life Experiences Survey (LES) (Sarason, Johnson, & Siegel, 1978) - The LES is a 60-item self-report measure that asks participants to indicate major stressors that they have experienced in the past 6 and/or 12 months. Examples of major stressors listed on the LES include events such as marriage or death of a spouse. In addition, the LES asked the respondent to rate the extent to which each event produced a positive, negative, or neutral impact when it occurred (i.e., intensity). In the current study the LES was administered at 6 month intervals to limit errors in recall and only used the total number of events reported, added across the 12 month time period. Based on the results of two separate studies, Sarason, Johnson, and Siegel (1978) reported that the reliability

coefficients for scores associated with negative events ranged from .56 to .88. Reliability coefficients for total number of events ranged from .63 to .64.

Medical Chart Review – Chart reviews were conducted by a master's level clinical graduate student under the supervision of a primary care physician and were used to determine whether each participant's hypertension was adequately controlled. Adequately controlled hypertension was defined as mean blood pressure readings less than 140 mmHg systolic and 90 mmHg diastolic gathered from all available clinic visits. Likewise, uncontrolled hypertension was defined as mean blood pressure readings greater than or equal to 140 mmHg systolic and 90 mmHg diastolic collected from all available clinic visits. Blood pressure readings were reviewed for the 12 months concurrent with each participant's enrollment in the study. Participants who had fewer than 2 blood pressure measurements taken on separate visits during the 12 months that they were enrolled in the study were excluded from the analysis. A minimum of 2 readings on separate occasions has been found to yield a reliability of .80 (Shepard, 1981), and is consistent with JNC VI (1997) guidelines. The protocol for determining controlled versus uncontrolled hypertension incorporated recommendations of JNC VI (1997) and was consistent with methodologies used in a number of other recent studies (see Ahluwalia, McNagny, & Rask, 1997; Goldstein, Carey, Levis, Madson, & Bernstein, 1994; Joshi et al., 1996).

Second, the total number of outpatient visits, the total number of missed outpatient appointments, the total number of antihypertensive medication class changes (i.e., change from one antihypertensive drug class to another), and the type (i.e., drug

class) of antihypertensive medication the participant had been prescribed were recorded for each participant for the one year that they were enrolled in the study. The total number of outpatient visits and missed appointments were reviewed by master's level clinical psychology graduate students. The total number of antihypertensive medication class changes and the type of antihypertensive agent(s) the participant had been prescribed were reviewed by a primary care physician. Antihypertensive agents were categorized into one of the following six medication classes: ACE inhibitor, alpha blocker, beta blocker, calcium channel blocker, diuretic, peripheral vasodilator.

Patient's Global Health Status Rating - For each participant, a primary care physician rated (1) the number of chronic illnesses and (2) the patient's global health status using a 7-point Likert scale, ranging from zero (patient is in good physical health) to six (patient has a terminal illness) (see Appendix B). This evaluation was based on a medical chart review. Since the patient's blood pressure control was likely to have been reflected in (i.e., confounded with) his or her global health status rating, this score was not used in the analysis. This measure was adapted from questionnaires used in previous research to objectively assess illness severity (Barsky, Wyshak, & Klerman, 1986; Jones, Mabe, & Riley, 1989; Mabe, Hobson, Jones, & Jarvis, 1988). This scale has been reported to have inter-rater reliability of .76 (Jones et al., 1989).

Weekly Stress Inventory (WSI) (Brantley, Jones, Boudreaux, & Catz, 1997) - The WSI is an 87-item self-report inventory that lists minor life stressors that an individual was likely to have experienced throughout a week. Examples of items include, "ran out of pocket money", and "child misbehaved". Items were rated on a

8-point Likert scale, with values ranging from 0 (did not occur) to 7 (extremely stressful). Thus, this measure yielded an event score, which is comprised of the total number of events endorsed, and an impact score which is the sum of subjective ratings of distress for the items endorsed. The WSI has been shown to have concurrent validity with the monthly Hassles scale ($r = .65$) and with their counterparts on the Daily Stress Inventory (DSI) (Brantley & Jones, 1989) (WSI event score with DSI event score $r = .77$ and WSI intensity score with DSI impact score $r = .84$). The WSI has previously been used in predicting dietary compliance among hemodialysis patients (Hitchcock, Brantley, Jones, & McKnight, 1990), headache activity among chronic headache sufferers (Mosley et al., 1991), and psychological distress in cardiac patients (Mosley et al., 1993).

Procedure

This study was conducted as part of a larger, ongoing study of stress and psychopathology in medical utilization funded by the National Institute of Mental Health [NIMH] (1 R01 MH51194-01A1). Randomly selected patients were approached in clinic waiting rooms and invited to participate in the study. Prospective participants were offered an explanation of the study and questions regarding the study were answered. Subjects who agreed to participate were asked to sign a consent form (see Appendix C) indicating that they understood the procedures involved in the study and their rights and privileges as research participants. If the participant was unable to follow written instructions, then the questionnaires were administered orally to this subject. At the time of recruitment all participants were administered the demographic

questionnaire, questioned about their cigarette smoking and alcohol consumption (taken from the BRFSS), and administered other questionnaires which were relevant to the NIMH study. Participants completed the WSI at recruitment, bimonthly over the telephone for 10 months, and in-person at a twelve-month follow-up interview (i.e., at recruitment, five telephone calls, and at twelve-month follow-up interview). Upon completion of the recruitment interview and questionnaires, participants were paid \$35.00. After each telephone call the participant was mailed a check for \$10.00 for his/her participation.

At recruitment and the twelve-month interview, participants were administered the ISEL and each participant's BMI was calculated. In addition, at the six-month telephone interview and at the twelve-month interview participants were administered the LES. Participants were paid \$50.00 upon completion of the twelve-month interview and questionnaires. At this time, chart reviews were performed by a primary care physician and graduate students to determine the presence and number of chronic illnesses, to ensure that all participants had hypertension, to assign participants to the controlled or uncontrolled hypertension group, to assess the type(s) of antihypertensive medications the participant had been prescribed over the past year, and to calculate the total number of outpatient visits, missed appointments, and medication drug class changes over the year in which they were enrolled in the study. Table 1 outlines the time over which the measures were administered.

A final major stress score was determined by summing the event scores from the two administrations of the LES for each participant. A final minor stress score was

determined by averaging the event scores from the seven administrations of the WSI for each participant. A final chronic minor stress score (chronic) was derived by summing the number of WSI items reported as occurring 4 or more times out of the 7 samples taken over the twelve month period, for each participant. This cut-off was chosen because it was believed to be a conservative operational definition for chronic stress as discussed in Scarinci et al. (in press). Finally, a final social support score was calculated by averaging the three administrations of the ISEL for each participant.

Table 1: Timeline of Administration of Measures

Measures	Recruit (0 mos)	Call 1 (2 mos)	Call 2 (4 mos)	Call 3 (6 mos)	Call 4 (8 mos)	Call 5 (10 mos)	Interview (12 mos)	Post Study
BMI	X						X	
BRFSS	X							
Chart Review								X
Demo	X							
ISEL	X						X	
LES				X			X	
Health Rating								X
WSI	X	X	X	X	X	X	X	

RESULTS

Demographic Data

Of a total of 249 participants recruited for the study, 231 had sufficient data to be included in the statistical analyses. Descriptive statistics were used to generate a profile of the sample based on the demographic information collected. The descriptive characteristics of the sample appear in Table 2. The demographic characteristics of the sample are consistent with data from previous studies of public primary care patients in Louisiana and the United States (Carmack, Boudreaux, Scarinci, & Brantley, 1997; Von Korff, et al., 1987).

The participants averaged 51.44 ($SD = 11.06$) years of age with a mean of 10.64 ($SD = 3.00$) years of education. The sample was comprised of 178 (77.10%) women and 190 (82.30%) were African-American. The participants consisted of 61 (26.40%) controlled and 170 (73.60%) uncontrolled hypertensives. Participants with controlled blood pressure had lower mean systolic and diastolic blood pressures ($M = 130.73$, $M = 78.49$) than individuals with uncontrolled blood pressure ($M = 155.23$, $M = 87.93$). In terms of race, the remaining 17.7% of the sample was Caucasian. The participants consisted of 81 (35.10%) married, 52 (22.50%) divorced, 48 (20.80%) single, 30 (13.00%) widowed, and 20 (8.70%) separated individuals. The mean individual monthly income for the sample was \$509.74 ($SD = 453.62$), 143 (61.90%) participants were unemployed, and 174 (75.30%) were without health insurance. The mean family income for the sample was \$918.71 ($SD = 637.82$). Only 13 participants (5.65%) reported having a monthly income above the low-income bracket as established by the U.S.

Bureau of the Census. Based on total family income, all but 10 participants (5.1%) met the low-income criteria.

Table 2: Descriptive Features of the Sample ($n = 231$)

Variable	<i>M</i>	<i>(SD)</i>	Range	<i>N</i>	<i>(%)</i>
Age	51.44	(11.06)	19 - 78		
Level of Education	10.64	(3.00)	0 - 17		
Individual Income (monthly)	509.74	(453.62)	0 - 3600		
Family Income (monthly)	918.71	(637.82)	0 - 4200		
Blood Pressure					
Controlled Group					
Systolic	130.73	(7.06)			
Diastolic	78.49	(8.35)			
Uncontrolled Group					
Systolic	155.23	(13.50)			
Diastolic	87.93	(9.39)			
Hypertension Control					
Controlled				61	(26.40)
Uncontrolled				170	(73.60)
Gender					
Male				53	(22.90)
Female				178	(77.10)
Race					
African-American				190	(82.30)
Caucasian (non-hispanic)				41	(17.70)
Marital Status					
Single				48	(20.80)
Married				81	(35.10)
Separated				20	(8.70)
Divorced				52	(22.50)
Widowed				30	(13.00)
Employment Status					
Unemployed				143	(61.90)
Employed				84	(36.40)
Data Missing				4	(1.70)
Health Insurance					
None				174	(75.30)
Medicare/Medicaid				41	(17.80)
Private				16	(6.90)

Group Differences in Demographic & Medical Data

T-test and chi-square analyses were conducted between the controlled and uncontrolled blood pressure group to assess for significant differences in descriptive features of the sample. However, these analyses revealed no significant differences for any of the demographic variables (Tables 3 & 4).

Table 3: T-test Analyses of Demographic Variables Between Controlled and Uncontrolled Blood Pressure Groups

Variable	Uncontrolled <i>M</i> (<i>SD</i>)	Controlled <i>M</i> (<i>SD</i>)	T-Value	DF	Sign.
Age	52.13 (10.65)	49.51 (12.00)	1.59	229	NS
Education	10.63 (3.13)	10.67 (2.63)	-0.10	229	NS
Income	553.66 (467.10)	441.96 (409.13)	1.35	228	NS

Table 4: Chi-Square Analyses of Demographic Variables Between Controlled and Uncontrolled Blood Pressure Groups

Variable	Uncontrolled	Controlled	χ^2	DF	Sign.
Gender			2.01	1	NS
Male	43	10			
Female	127	51			
Race			0.21	1	NS
African-American	141	49			
Caucasian	29	12			
Marital Status			1.01	4	NS
Single	34	14			
Married	60	21			
Separated	15	5			
Divorced	37	15			
Widowed	24	6			
Employment			0.02	1	NS
Employed	61	23			
Unemployed	105	38			
Health Insurance			1.63	4	NS
None	131	43			
Medicare/aid	28	12			
Private	11	5			

Next, t-test and chi-square analyses were conducted between the controlled and uncontrolled blood pressure group to determine whether significant group differences

existed in terms of a number of medical variables including: BMI, alcohol consumption, cigarette smoking, number of chronic illnesses, number of outpatient visits, number of missed appointments, number of antihypertensive medication class changes, and type(s) of antihypertensive medications prescribed. A t-test conducted between the controlled and uncontrolled blood pressure groups revealed that individuals with uncontrolled blood pressure had missed a significantly greater number of medical appointments [$t(160) = 3.37, p < .001$]. However, t-tests revealed no other significant differences between the groups for total number of outpatient visits, medication changes, cigarettes smoked per day, alcoholic beverages consumed per month, BMI, or chronic illnesses (Table 5).

Table 5: T-test Analyses of Medical Variables Between Controlled and Uncontrolled Blood Pressure Groups

Variable	Uncontrolled		Controlled		T-Value	DF	Sign.
	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)			
Missed Appointments (yr)	1.50	(1.79)	0.80	(1.20)	3.37	160	< .001
Outpatient Visits (yr)	9.51	(7.19)	7.98	(4.89)	1.54	228	NS
Medication Changes (yr)	0.48	(0.84)	0.30	(0.56)	1.89	160	NS
Cigarettes Smoked (day)	2.91	(8.60)	4.11	(9.76)	-0.90	229	NS
Alcoholic Beverages (month)	6.18	(24.93)	3.66	(10.94)	0.76	228	NS
BMI	32.14	(8.00)	33.17	(8.52)	-0.84	229	NS
Chronic Illnesses	3.07	(1.31)	3.21	(1.17)	-0.75	229	NS

A chi-square revealed that significant group differences exist between controlled and uncontrolled hypertensives in terms of prescription of a calcium channel blocker antihypertensive medication [$\chi^2(1) = 11.87, p < .001$]. This result indicated that

hypertensives with controlled blood pressure were less likely to be taking a calcium channel blocker. Chi-square analyses failed to reveal any other significant group differences for any of the other five classes of antihypertensive medication (i.e., ACE inhibitor, alpha blocker, beta blocker, diuretic, peripheral vasodilator) or for number of cigarette smokers in each group (Table 6).

Table 6: Chi-Square Analyses of Medical Variables Between Controlled and Uncontrolled Blood Pressure Groups

Variable	Uncontrolled	Controlled	χ^2	DF	Sign.
Cigarette Smokers	32	15	0.92	1	NS
Calcium Channel Blocker			11.87	1	<.001
Prescribed	91	17			
Not Prescribed	79	44			
ACE Inhibitor			2.77	1	NS
Prescribed	88	24			
Not Prescribed	82	37			
Alpha Blocker			2.01	1	NS
Prescribed	43	10			
Not Prescribed	127	51			
Beta Blocker			2.08	1	NS
Prescribed	30	6			
Not Prescribed	140	55			
Diuretic			0.71	1	NS
Prescribed	95	36			
Not Prescribed	75	25			
Peripheral Vasodilator			0.30	1	NS
Prescribed	5	1			
Not Prescribed	165	60			

Descriptive Statistics for Medical and Psychological Predictor Variables

Descriptive statistics were computed for all continuous medical and psychological variables including, number of medication changes, number of missed appointments, number of cigarettes smoked in the past month, number of alcoholic

beverages consumed in the past month, BMI, LES, WSI, chronic, and ISEL. Table 7 displays the means and standard deviations of continuous medical and psychological predictor variables. Finally, Pearson correlation intercorrelation coefficients were calculated for the four psychological variables (i.e., WSI, LES, ISEL, chronic) to assess for significant overlap of independent measures (Table 8). The WSI and chronic stress variables were found to be significantly correlated ($r = 0.96, p < .001$). Since the chronic stress variable was derived from the WSI, is an unstandardized measure, and appears to be measuring the same construct as the WSI (i.e., provides redundant information), it was not included in the final analysis.

**Table 7: Medical and Psychological Predictor Variables:
Descriptive Statistics for Sample ($n = 231$)**

Variable	<i>M</i>	<i>(SD)</i>	Range
Medication Changes (yr)	0.43	(0.78)	0 - 4
Missed Appointments (yr)	1.31	(1.68)	0 - 10
Outpatient Visits (yr)	9.11	(6.68)	1 - 54
Cigarettes Smoked (day)	3.23	(8.91)	0 - 60
Alcoholic Beverages (month)	5.51	(22.10)	0 - 240
BMI	32.41	(8.13)	17.54 - 62.97
WSI	20.56	(13.58)	0.71 - 65.86
LES	6.38	(5.55)	0 - 32
Chronic	15.79	(14.30)	0 - 77
ISEL	87.21	(18.65)	31.50 - 117.50

Table 8: Pearson Intercorrelation Coefficients of Psychological Predictors

	Chronic	ISEL	LES	WSI
Chronic	-----	-----	-----	-----
ISEL	-0.27, $p = \text{NS}$	-----	-----	-----
LES	0.59, $p < .001$	-0.17, $p < .01$	-----	-----
WSI	0.96, $p < .001$	-0.30, $p < .001$	0.62, $p < .001$	-----

Prediction of Blood Pressure Control

This study sought to answer the following four research questions: (1) Do major, minor, and chronic stress collectively serve as an independent predictor of uncontrolled hypertension? (2) Do major, minor, and chronic stress each independently serve as a predictor of uncontrolled hypertension? (3) Does social support serve as an independent predictor of uncontrolled hypertension? (4) Does social support moderate the association between stress (major, minor, and chronic stress considered individually or considered collectively) and uncontrolled hypertension? In order to best address these four research questions a logistic regression analysis was performed.

As noted above, since the chronic stress variable was highly correlated with the WSI, it was removed from the logistic regression equation. Additionally, since group differences were discovered for the medical variables of number of missed appointments and for prescription of a calcium channel blocker antihypertensive medication, these variables were entered as the first step in the logistic regression, to statistically control for possible confounds. Again, as noted earlier, the outcome variable in the equation was dichotomized into “controlled” or “uncontrolled” blood pressure.

Using a forced entry procedure with a significance level of .05 as the criterion for entrance into the equation, prescription of a calcium channel antihypertensive medication and number of missed appointments were the only factors that were significant predictors of controlled blood pressure (Table 9). The LES and WSI did not independently or collectively serve as significant predictors of blood pressure control. Further, the ISEL was not found to serve as an independent predictor of uncontrolled

hypertension and there was no evidence that this variable moderated the association between stress and uncontrolled hypertension.

Table 9: Logistic Regression Results for Predictors of Controlled Hypertension

Variable	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>Sig</i>	<i>R</i>	<i>Odds Ratio</i>
Calcium Channel	1.07	0.34	9.85	< .001	0.17	2.93
Missed Appointments	-0.29	0.13	5.08	< .05	-0.11	0.75
LES	-0.01	0.30	0.00	NS	0.00	1.00
WSI	-0.07	0.11	0.39	NS	0.00	0.93
ISEL	0.00	0.02	0.01	NS	0.00	1.00
LES*WSI	0.01	0.01	0.48	NS	0.00	1.01
ISEL*LES	0.00	0.00	0.00	NS	0.00	1.00
ISEL*WSI	0.00	0.00	0.35	NS	0.00	1.00
ISEL*LES*WSI	0.00	0.00	0.35	NS	0.00	1.00

An alternative method that may be used to assess the relation between the significant predictors (i.e., prescription of a calcium channel antihypertensive agent, number of missed medical appointments) is provided by the odds ratio (Hosmer & Lemeshow, 1989). This value for a variable yields the change in odds for a case when the value of that variable increases by one. Therefore, with one additional missed medical appointment, the odds of having controlled blood pressure will decrease by a factor of 0.75. Second, absence of a prescription of a calcium channel blocker increases the odds of having controlled blood pressure by a factor of 2.93.

DISCUSSION

Stress was not found to predict blood pressure control in this sample of low-income individuals attending primary care clinics. Social support was also not found to predict blood pressure control in this sample. However, the number of missed medical appointments and prescription of a calcium channel blocker were found to be associated with uncontrolled hypertension. Unfortunately, chronic stress was unable to be entered into the logistic regression equation since it appeared to be measuring a construct similar to that measured by the WSI. Since chronic stress was being assessed with an instrument originally designed to measure minor stress, the chronic stress variable was removed from the model in order that the minor stress variable could be included.

The results indicated that as an individual's number of missed appointments increased their chance of having controlled hypertension decreased. Other researchers have cited poor adherence to treatment as a major barrier to control of hypertension and have estimated that approximately 50% of patients with hypertension fail to keep their follow-up appointments (Clark, 1991). Although a patient's degree of compliance with his or her medical regimen has been considered an important factor in health across a wide range of other medical conditions and has been found to be a significant predictor of blood pressure control by a number of other researchers (Caldwell et al., 1983; Joshi et al., 1996; Shea et al., 1992), the current study extends these findings to a low-income, predominantly African-American, primary care population.

The second variable discovered to be a significant predictor of uncontrolled hypertension was prescription of a calcium channel blocker antihypertensive medication.

The results indicated that individuals without a prescription of this class of medication had an increased probability of having controlled blood pressure. This finding appears logical because only those individuals with sustained uncontrolled blood pressure are prescribed this type of medication. That is, this medication is not a recommended first-line treatment for hypertension, and is only typically used after initial attempts using other classes of antihypertensive medication have failed (JNC VI, 1997; Kaplan & Gifford, 1996).

When the mean number of life events reported by the sample of the current study (6.38) was compared to the normative sample of undergraduates (Sarason et al., 1978), we found that our subjects reported experiencing fewer life events. The mean LES scores for the normative sample ranged from 11.53 for males to 12.35 for females. Comparing the obtained number and impact of major life events with previous studies that have used the LES with middle-aged medical patients, we find a wide range in the number of life events reported. The number of life events endorsed in studies examining middle-aged medical patients (e.g., patients with gastrointestinal diseases, low-income pregnant women) was found to range from 3.8 to 19.3 (Bresnahan, Zuckerman, & Cabral, 1992; Dinan, O'Keane, O'Boyle, Chua, & Keeling, 1991). However, it is difficult to compare the LES scores found in this study to those of other studies since a number of different versions of the LES were used (i.e., LES measures containing different numbers of items).

The obtained mean WSI score (20.56) was also lower than that reported in the normative sample (Brantley et al., 1997). The WSI mean scores in the normative sample

ranged from 24.65 to 38.25, with older individuals endorsing fewer events than younger people. Prior research using the WSI with medical populations has found that these samples endorse fewer events than the normative sample. These studies have yielded scores ranging from 12.7 in a sample of hemodialysis patients to 23.3 in a sample of headache patients (Hitchcock et al., 1990; Mosley et al., 1996; Mosley et al., 1991). In these studies there was also a trend suggesting that older adults tended to endorse fewer events. The fact that the sample was comprised of middle-aged medical patients may explain why the sample tended to endorse fewer minor life events than the normative sample not taken from a medical population, since prior studies with medical patients have yielded a wide range in the number of minor life events reported.

From a statistical point of view, this study possessed adequate power ($1 - \beta > .80$) to detect modest effects with an $\alpha < .05$ for the logistic regression analysis (Hsieh, 1989; Whittmore, 1981). However, several methodological limitations may have contributed to the lack of finding major stress as a significant predictor of hypertension control. First, since participants were recruited from medical clinic waiting rooms, it may be that the range of compliance was restricted for our sample. That is, if hypertensive patients, who failed to attend during the recruitment phase of our study, were able to have been included in the sample, we may have found a group of patients to be severely noncompliant.

Second, one might argue that the methods used to assess major life events or blood pressure control may not have possessed sufficient sensitivity to adequately measure these constructs. However, past research using similar life event measures

found association between major life events and blood pressure control (e.g., Buck & Donner, 1984; Caldwell et al., 1983; Egan et al., 1983; Joshi et al., 1996). Further, the manner in which control of hypertension was measured is consistent with methodologies used in a number of other studies (see Ahluwalia et al., 1997; Goldstein et al., 1994; Joshi et al., 1996), is in compliance with recommendations of JNC VI (1997), and has been found to yield adequate reliability (Shepard, 1981).

A third limitation that may have contributed to negative findings is the relatively low incidence of major life events reported by our sample. Unfortunately, since previous studies examining the relation between life events and blood pressure control do not provide descriptive information about the number of life events reported by their samples, we were unable to compare the incidence of life events reported by our sample to those of previous research. Since the sample reported a low incidence of major stressors in comparison to normative data, it may be that the study sample simply did not experience a level of stress which would be expected to play a significant role in blood pressure control. However, the normative data for the LES was based on a college sample and one might expect middle-aged medical patients to report a lower incidence of stressors, similar to the pattern found in the WSI normative data. Turning to the WSI, the sample also tended to report a lower incidence of stressors than the normative data. However, the number of minor stressors reported is consistent with those reported in other studies that have used this instrument in other medical populations.

Although evidence suggests that social support has a positive influence on physical health and may moderate the relation between stress and physical illness (Cohen

& Hoberman, 1983; House, Landis, & Umberson, 1988; Levy et al., 1990; Orth-Gomer, & Unden, 1990), social support was not found to predict blood pressure control or moderate the effects of stress in established hypertensives in this study. The obtained mean score on the ISEL (87.21) was much higher than that reported in the normative sample. The ISEL mean scores in the normative sample, comprised of both nonstudent community and undergraduate participants ranged from 32.90 to 34.40. The adequate level of social support reported by the sample in this study may account for the lack of an association between social support and stress or blood pressure control. Indeed, previous research has suggested that social support is most important when it is very low and that it tends not to be predictive of physical health status when it is adequate (Cohen & Hoberman, 1983).

Although a good deal of effort was made to control for demographic and medical risk factors of uncontrolled hypertension, it may be that other factors not examined serve as more powerful predictors of blood pressure control in this population. Factors such as medication compliance, understanding of one's drug regimen, compliance with dietary restrictions, level of physical activity or compliance with an aerobic exercise program, lack of a primary care physician, using emergency room services as a primary source of medical care, or side effects of antihypertensive medication have been found by others to predict uncontrolled hypertension (Caldwell et al., 1983; Clark, 1991; Joshi et al., 1996; JNC VI, 1997; Shea et al., 1992). Further, these factors are generally considered important factors in the treatment of hypertension.

In particular, medication compliance has been demonstrated to be a predictor of blood pressure control among hypertensive patients. It may be that in a low-income, primarily African-American, primary care population, this particular predictor is the most powerful. Indeed, there exists some evidence suggesting that the removal of financial barriers to compliance in low-income hypertensives by providing them with free medication leads to significant gains in blood pressure control (Applegate et al., 1998). Finally, although some of these past studies have found a relation between the types of demographic and medical risk factors (e.g., age, BMI) included in the present study, it may be that other more powerful predictors exist for this population that have yet to be identified.

Alternatively, it may be that other predictors that were not measured by the current study, such as the ones noted above, masked the association between stress and blood pressure control. Another possibility is that the impact of stress on blood pressure control might not be important until other more powerful factors are accounted for (e.g., medication or dietary compliance, missed appointments). A final explanation for the current findings is that stress and social support might indirectly have a role in blood pressure control through their impact on health behaviors (i.e., compliance with medical recommendations). Indeed, a number of researchers have proposed that stress may interfere with compliance with medical recommendations or increase the likelihood that an individual will engage in behaviors that may have a deleterious impact on health (e.g., smoking) (Brantley & Ames, in press). Future research might address these issues in low-income hypertensives.

At present, the impact of major stress, minor stress, chronic stress, social support on blood pressure control remains inconclusive. Although the present study was unable to examine the impact of chronic stress on blood pressure control separately, it may be that since chronic stress significantly overlaps with minor stress, that the WSI adequately measures this concept in this population. That is, it might be that due to limited financial resources low-income individuals have a reduced capacity to eradicate stressors once they occur. As a result, these stressors would simply be expected to endure over time. Future research might examine whether a self-report measure specifically designed to assess the construct of chronic stress is needed, or if this concept can be adequately accounted for with repeated administrations of existing stress measures.

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APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE

- 1) Subject Number: _____ 2) Age: _____
- 3) Medical Record #: _____ 4) Clinic: () Med Clinic () Family Prac
- 5) Sex (circle one): Male Female 6) Job/Occupation: _____
- 7) Marital Status (circle one): 8) Race (circle one):
- a. Single a. White (Non-Hispanic)
b. Married b. African-American
c. Separated c. Hispanic
d. Divorced d. Asian
e. Other (please specify) _____ e. Other (please specify) _____
- 9) Please circle the highest grade you have completed:
Grade school: 1 2 3 4 5 6 7 8 9 10 11 12
College/Trade School: 1 year 2 years 3 years 4 years More than 4 years
Have you completed high school? (circle one): Yes No
If you have not graduated from high school, do you have a GED? (circle one): Yes No
- 10) Other education (please specify type and number of years): _____
- 11a) What is your average monthly income? \$ _____
11b) Where does this money come from? (circle each one that applies to you and indicate the amount of money you receive from that source each month):
- a. My job/Career \$ _____
b. Public assistance/Welfare \$ _____
c. Social Security/Disability \$ _____
d. Unemployment \$ _____
e. Child support/Alimony \$ _____
f. Allowance \$ _____
g. List other sources of income: _____ amount \$ _____
- 12a) How many people live in your home? _____
12b) What is the total monthly income including everyone in your home? \$ _____

12c) Where does this money come from? (circle each one that applies to your family and indicate the amount of money your family receives from that source each month):

- a. Jobs/Careers \$ _____
- b. Public assistance/Welfare \$ _____
- c. Social Security/Disability \$ _____
- d. Unemployment \$ _____
- e. Child support/Alimony \$ _____
- f. List other sources of income: _____ amount \$ _____

13) Have you ever received treatment for a mental health problem? Yes No

What kind of problem? _____

14) Have you ever received treatment for a drug or alcohol problem? Yes No

What kind of problem? _____

15) Do you have any health insurance? Yes No If so, what kind? _____

16) Address: _____

17) Phone Number: _____

APPENDIX B

PATIENT'S GLOBAL HEALTH STATUS RATING

Physician: _____
EKL #: _____

Subject Number: _____
Date: _____

Does this patient have any existing medical condition(s)? If yes, list the medical conditions and indicate if they are acute or chronic.

MEDICAL CONDITION	ACUTE/CHRONIC
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Please rate the patient's global health status using the following scale by circling the number which best describes the patient's overall physical health:

- 0 patient is in good physical health with a history of only routine minor illnesses.
- 1 patient is largely free of serious medical problems but presents with numerous undiagnosed symptoms and complaints.
- 2 patient is largely free of serious medical problems but has one or more risk factors (e.g., smoking) which places him/her at risk for the development of future illness.
- 3 patient has a history of serious disease which is currently in remission - patient appears in good health and is compliant with medical recommendations.
OR
patient has a chronic degenerative disease (e.g., diabetes) which is well controlled and patient is compliant with medical recommendations.
- 4 patient has a history of serious disease which is currently in remission - but patient is non-compliant, engages in health risk behaviors, or has additional aggravating illnesses.
- 5 patient currently has one or more chronic degenerative disease(s) which is poorly controlled.
- 6 patient has terminal illness; death is imminent.

APPENDIX C
CONSENT FORM

1. **Study Title:** The Roles of Stress, Social Support, and Psychopathology in Primary Care Utilization.
2. **Performance Sites:** Family Practice and General Medicine Clinics, Earl K. Long Medical Center, Baton Rouge, LA.
3. **Names and Telephone Numbers of Investigators:**
For 24-hour access, please contact Isabel Scarinci or Annette Springer at 358-1105.
Phillip J. Brantley, Ph.D.....(504) 358-1105
John Howe, M.D.....(504) 358-1103
Glenn Jones, Ph.D.....(504) 358-1105
4. **Purpose of the Study:** This is a research study to determine the roles of stress, mental health, social support, and coping strategies in primary care utilization.
5. **Subject Inclusion Criteria:** Male and female volunteers ages 18 and older who are patients in the EKL Department of Family Medicine or EKL General Medicine Clinic will qualify as subjects in this research project.
6. **Subject Exclusion Criteria:** Subjects will be excluded from Phase II of the project for not having a phone at home.
7. **Description of the Study:** This is a research study to determine the role of stress, mental health, social support, and coping strategies in primary care utilization. Subjects will participate in the study in two phases. Subjects do not have to participate in Phase II to participate in Phase I. Subjects must participate in Phase I to participate in Phase II.
In Phase I, subjects will be chosen from waiting rooms at the EKL Department of Family Medicine and General Medicine Clinic. Subjects who agree to participate will complete the demographic questionnaire and the General Health Questionnaire (GHQ).
Phase II of this project will be divided into 4 tasks:
(1) Subjects will complete the following questionnaires on the same day: the Interpersonal Support Evaluation List (ISEL) (a measure of social support), the Ways of Coping Questionnaire (WOC) (a measure of coping strategies), the Weekly Stress Inventory (WSI) (a measure of minor stress), the 1994 Behavioral Risk Factor Questionnaire (a measure of health risk behaviors), and the Ways of Religious Coping Scale (a measure of religious coping).

Subject's Initials

(2) Subjects will be asked to complete the WSI and a self-report hospital utilization questionnaire (SRU) bimonthly for one year, and in the sixth month the Life Experiences Survey (LES) (a measure of major stressors) will be added to the phone interview. A research assistant will contact subjects by phone once every month in order to collect the responses to these questionnaires and to answer any questions subjects may have;

(3) One year after the initial contact, subjects will be scheduled to complete the following at the Center for Primary Care Research at EKL: (a) Composite International Diagnostic Interview (CIDI) (a mental health interview), (b) ISEL, (c) WOC, and (d) SRU.

(4) Subjects will be contacted by phone 3, 6, 9, and 12 months following the interview and asked to answer the SRU.

8. Benefits to Subject: At the end of the study, subjects will be provided with a summary report of findings and their relevance to primary care utilization, at their request. If needed, subjects will receive a referral to an appropriate agency.
9. Risks to Subject: No known physical risks. Participation in this study may involve unforeseen risks.
10. Alternatives to Participation in the Study: Since no treatment is involved in this study, the only alternative to participation in the study is not to participate.
11. Subject Removal: Subjects will be removed from the study if they fail to complete (1) Phase I; (2) part 1 of Phase II; (3) 80% or more of requested bimonthly interviews; (4) part 3 or 4 of Phase II. There is no risk involved in being removed from the study.
12. Subject's Right to Refuse to Participate: Study subjects may refuse to participate or withdraw from the study at any time without jeopardizing, in any way, their medical treatment at this institution in the present or future. Should significant new findings develop during the course of the research that may relate to the subject's willingness to continue participation, that information will be provided to the subject. There are no special risks involved in withdrawal from the study.
13. Subject's Right to Privacy: The results of the study may be released to the funding agency. The results of the study may be published. The privacy of subjects will be protected and they will not be identified in any way.

Subject's Initials

14. **Release of Information:** The medical records related to the study are available to the sponsoring agency. Information provided during the course of the study is confidential. The only exceptions are in cases where subjects indicate suicidal desires, homicidal desires, or child abuse. In these instances the researchers are ethically and legally required to inform their supervisors regarding the subject's desires.
15. **Financial Information:**
 A. Participation in this study will not result in any extra charges above and beyond those routinely incurred by patients with similar illnesses.
 B. The costs of study related and unforeseen complications must be met by subjects.
 C. Subject Payment: Subjects will be paid \$15 (fifteen dollars) for completing Phase I of the study. Subjects will be paid \$20 (twenty dollars) for completing part 1 of Phase II. Subjects will be paid \$10 (ten dollars) for each phone interview completed during part 2 Phase II. Subjects will be paid \$50 (fifty dollars) for completing part 3 of Phase II and \$10 (ten dollars) for each phone interview completed during part 4 of Phase II.
16. **Signatures:** The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to investigators listed on page 1 of this consent form. I understand that if I have questions about subjects' rights or other concerns, I can contact the Chancellor of LSU Medical Center, at (504) 568-4801. I agree with the terms above and acknowledge I have been given a copy of the consent form.

 Signature of Subject

 Date

 Signature of Witness

 Date

The study subject has indicated to me that the subject is unable to read. I certify that I have read this consent form to the subject and explained that by completing the signature line above the subject has agreed to participate.

 Signature of Reader

 Date

The study subject is a child and I certify that I am his/her legal guardian.

 Legal Guardian Name

 Legal Guardian Signature

 Date

 Child's Name and Age

 Child's Signature

 Date

Reason for not obtaining child assent: _____

VITA

Steven C. Ames was born in and grew up in the northwest suburbs of Chicago, Illinois. He attended Southern Illinois University at Carbondale where he received his bachelor of arts degree in psychology in May 1994, graduating *magna cum laude*. In August, 1994, he began his doctoral training in clinical psychology under Phillip J. Brantley, Ph.D., at Louisiana State University. In May 1997 he was awarded the master of arts degree in psychology. In May, 1998 he began a one-year internship at the Medical University of South Carolina, under the direction of John C. Roitzsch, Ph.D. His primary research interest is investigation of the impact psychosocial variables have on physical disease.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Steven C. Ames

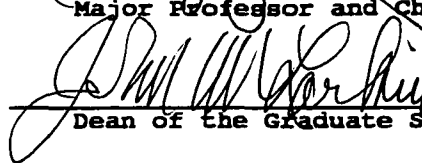
Major Field: Psychology

Title of Dissertation: LIFE EVENTS, SOCIAL SUPPORT, AND BLOOD PRESSURE
CONTROL IN LOW-INCOME HYPERTENSIVE PATIENTS

Approved:

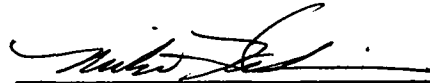


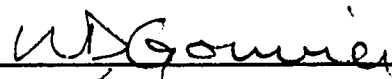
Major Professor and Chairman

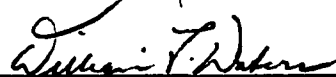


Dean of the Graduate School

EXAMINING COMMITTEE:









Date of Examination:

16 October 1998